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Abstract

In our society, there is an ever-increasing demand for media, and the need, as much as ever, for ordinary people to think critically about ideas. This paper presents the first steps toward the creation of a visual language that might convey these ideas to an educational software or infographic audience. Since the problem I am trying to solve is one of agreement over abstract symbols, I conducted a paper questionnaire in which respondents selected shapes that they associated the most with a particular one-word concept. In most of the questionnaire categories (nature, order, significance, good, anti-, and divinity), most respondents chose one symbol over the other. Future work is needed to reproduce these results, but the results point to the possibility that we can indeed design a universal visual language of ideas with "dialects" for different cultures.

Headings:

Design

Information theory

Knowledge representation

TOWARD A VISUAL LANGUAGE OF ABSTRACT IDEAS
EFFECT OF CONCEPTS ON PERCEPTION OF SYMBOLS

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Research Question

How can a visual language convey philosophical ideas to an educational software or infographic audience using geometric or organic shapes?

Motivation and Rationale

In our society, there is an ever-increasing demand for media, and the need, as much as ever, for ordinary people to think critically about ideas. There are many games and other media that purport to teach facts, but not many that teach critical thinking about ideas. This paper presents the first steps toward the creation of a visual language that might convey these ideas to an educational software or infographic audience.

The planned language will involve static pictures grouped together by users and a simple key, and this paper will focus on the general principles behind the language's design. The key will be composed of simple shapes that convey the assumptions behind the ideas.

Conceptual Frameworks and Literature Review

The research question requires some work on what philosophical ideas are composed of, since simplification of ideas is necessary for their expression in a visual language.

A Paradox

The smallest unit of an idea has to be larger than a word; a word in itself contains infinite assumptions that may have little to do with the text. Says Mark Rosenfelder, "The complexity of meaning frustrates simplistic attempts to reduce meaning to reference or to componential analysis" (107). This is not a good idea in science, which

deals with the infinite space of the universe, but this project deals with the finite space of a piece of paper or computer screen and the maximum cognitive load for a person's brain. This finiteness makes it necessary to use one shape for a concept that contains perhaps multiple words.

A good example of the simplification of concepts, though not their basic units (assumptions), is Genís Carreras' book *Philographics.* Carreras uses simple shapes and colors to convey some of the major historical philosophical ideas. These are simple and concrete representations of the concrete objects associated with the ideas, such as an upside-down cross for atheism, or the mirror of Venus symbol for feminism (82).

What Is Summarizing?

We now move to what exactly the signs will reduce the text to, since some reduction has to take place for the language to mean anything. Languages break down into concepts represented by grammar rather than simply words. We can see that this is true by the knowledge that words meaning a concept have synonyms. Conversely, we see that each word can have more than one meaning, or what Gottlob Frege called a sense (MacKenzie 90). Thus, concepts themselves are not linear things that can be contained within the boxes of words and grammar. As in the paradox discussed above, they are more like a web of relationships between objects, as I will discuss below.

First, we must not simply summarize the ideas. Summarizing uses unspoken assumptions to restate the ideas. We want to unpack those assumptions instead. So, before we unpack, have to define assumptions.

What Are Assumptions?

Assumptions are unconscious generalizations, which are patterns that fill in the patterns of the world in absence of experience. An example of an assumption is that romantic love is good. Assumptions are also relationships between concepts (Bertin 5).

If a concept is represented by one shape, then an assumption would be represented by a picture or set of shapes that convey the concepts as components of assumptions (Bertin 16). They are the most basic unit of an idea, formalized as premises in logic. Experience, as John Locke says, forms our simple ideas of things, based on observation, which form the patterns (180-181), which form the assumptions on which our ideas are based.

Assumption Genesis and Structure

In discussing what assumptions are, we will discuss how they are created. Many assumptions are created by memes, which are transmitted by culture and modified by its members; they are replicators. These replicators make ideas, which are systems; Dawkins's example of the way of making an arch is an example of this (Dawkins 192). A way of making an arch is a system that make other systems, like that of making buildings, so that memes make other memes.

In real terms, this means that a myth, like that of a seven-day creation, will be passed from generation to generation because of the seemingly explanatory nature of the story. It might seem to explain how there are many different kinds of animals, or why bad things happen. This myth will turn into a cultural assumption. If the first woman brought on the bad things of the world, for example, the assumption quickly becomes that women are morally inferior to men. In many myths, the first of something describes the rest of that category, as the myth of Eve seems to describe all women. In fact, the early Christian philosopher Tertullian thundered at women, "Do you not know you are an Eve?" to justify his extreme misogyny (De cultu feminarum, Book I: Chapter I). Thus, the meme that women are morally inferior to men persisted into a medieval European cultural assumption.

As well as origins, assumptions also have pointers, which indicate what the assumption is about. Examples are "nature" and "people". An assumption is composed mainly of binary qualities, like raw/cooked, good/evil, etc. (Hall 53). To show this, we can make Boolean-like visual operators that define the two qualities like an on-off switch (van Benthem 115-116).

Assumptions are also going to be used as the smallest unit of the idea, not only because they are largely unconscious and unspoken, but also because they provide meaningful relations between facts (van Benthem 119). "Romantic love is good", as an assumption, is a relationship between "love" and "romantic" to make a type of love, and "good" is the relationship between "romantic love" and our value judgements. Indeed, our value judgements load our assumptions with all that the value judgement implies about what we are assuming things about. "John is a bully" is an example that applies the bad value judgement involved in the word "bully" to John.

To Unpack

In unpacking an assumption, or making it obvious, we have to answer the following questions. What do(es) the sentence(s) convey about the person who wrote it/them? What point of view does the person have? What is the truth value of the assumption? Can we break down the assumption into constituent parts? Which of some given pairs of opposing concepts does the assumption belong to (Hall 53)?

Systematic Visual Language

Moving from the linguistic aspects of the visual language, the rest of the paper will examine the visual aspects. A visual language, since users perceive it quickly, has to be intuitive.

What Does It Mean To Be Intuitive?

What makes a system of signs and symbols intuitive? The first aspect of this is human agreement, which is why the arrow is such a good symbol for direction and causation (MacKenzie 15). There is also agreement on what makes things explicit, like whether the table without the arrows is explicit enough not to use with arrows (MacKenzie 4-5).

The holy grail of an intuitive system is that people do not have to look through a rulebook to "get it". This means, on some level, appealing to emotion (Cobley and Jansz 15). Many interfaces successfully do this, as interfaces seen as appealing seem more useable than less appealing interfaces (Norman 2002). This gives the sign motivation, or having a natural connection between signifier and signified (Guiraud 25).

Bantjes Community Map

The Bantjes community map (Rendgen 328-329) comes very close to the ideal, but is not an attempt to map texts by abstract ideas. It uses circles as a metaphor for the wholeness of the community, and flowing lines for the passage of time in the community, which are fairly straightforward symbols. However, it is very language-dependent. A non-English-speaker would be hard-pressed to read it.

Gource And Codeflower

In the Gource mapping system for software coding by Andrew Caudwell (2015), all nodes are of equal value, and there is symbol repetition that absolutely relies on natural language for message clarity. Gource has two symbols: branches and nodes, as does CodeFlower, a software mapping system for version control by François Zaninotto (2013). Nodes are items, whereas branches are relations between those items. We cannot rely so totally on natural language for meaning, because in our global society language dependence is a liability. Language contains many of a culture's unspoken assumptions, which find their way into philosophy. For

example, the words "good" and "god" are related in our language, and so "good" is close to "god". A Gource-like system would not capture philosophical assumptions like this because it weights each node the same in its hierarchy, regardless of the assumptions underlying it. A truly intuitive system would have things weighted by importance to the underlying idea and not be so language-dependent. CodeFlower's system of weighting each node so that the more important ones are larger is a little better, but even a system like that would not end up exploiting the range of symbols that we can have to explain various concepts.

Allegory

Allegories and idealized paintings, as symbolic art, are culturally bound. *Parnassus*, by Renaissance painter Raphael in the Vatican's Room of the Signature, has many such symbols that are culturally bound by the High Renaissance and Greek mythology. The laurel tree for poetic glory and the personification of poetry on the ceiling vault are culturally bound symbols (Grebe 223).

ANNIS and Textexture

ANNIS, the ANNotation of Information Structure, is a basic visualization tool for texts by a team of developers from the Georgetown University and Humbolt-Universität of Berlin (Krause, et al. 2015). It only visualizes the texts on a superficial level, paying attention to the structure of sentences and frequency of words. Textexture, by Nodus Labs, does the same, only in a network form (Paranyushkin 2012). It highlights relationships between the major words in the text, but does not tell us their nature. Thus, both tools only summarize the text rather than unpacking it.

Pictograms

Pictograms are small pictures meant to replace words, used in signage in modern times. The problem with these is that they are often shown in sequence, which

could be representing time, order of importance, or any number of things. In practice, this is usually not a problem, however, as people understand the pictograms in the context of time and culture. We understand what a STOP sign is because it is embedded in our car culture. We also understand that a road sign that we come to after another means that we follow the one we find first; the order of the car's journey creates context and our culture creates constraint on how to understand the STOP sign (Norman 85).

Formal Logic

Formal logic seems to provide the answer, but it is linear, and it does not associate the way ideas in the real world do. Assumptions underlie premises, which lead to conclusions; instead of examining how assumptions lead to conclusions, I want to unpack the assumptions

themselves (Priest 3). The language has to have inductive validity, when the premises about specific things lead to generalities with a truth value of true. They also have to be deductively true, when the premises lead to specific and true conclusions; formal logic concentrates on deductive logic. This is not to discount formal logic entirely, for it can be very useful for deriving pure philosophical principles; however, the language is for expressing those principles visually and what underlies them (Priest 4, 9).

The Type Problem

This problem is of classification. What type of idea or assumption is something, and how to begin to classify the types? The answer may be to use the SPICE (social, political, intellectual, cultural, economic) system used in history (multiple Advanced Placement history teachers use this) as a starting point. The first large category below is ideas having to do with human affairs, while the second has to do with ideas about what

transcends or is outside of humanity. I have then sorted ideas and assumptions into the following categories:

- Social/Political/Economic/Cultural Ideas:
    - Power: who can control own and/or others' destiny
    - Will: desire to act
    - Good: what is desirable or moral
    - Wealth: amount of resources an entity has
    - Wellness: to be in a desirable state physically
    - Happiness: to be in a desirable state emotionally
- Intellectual/Scientific Ideas:
    - Significance: magnitude of an effect on something
    - Nature: what is around us and influences us
    - Order: an arrangement of things
    - Divine: a power over nature
    - Anti-: the opposite of any other idea
    - Proper: the desirable state
    - To be: to exist, esp. in a certain way
    - Possibility: what can or could be, but is not certain
    - Random: no particular order
    - Cause: what makes something happen
    - Group: more than one entity

Objects

Objects are a particular element in the language which are easily recognizable, to help people interpret the language. The most common objects will be people, since

philosophy is about people. The other common symbol is a circle for the universe. People will be a common object in this language since people and their gestures are almost universal symbols. We evolved certain body language for certain states of mind and attitudes. For example, an upright and stiff posture usually means dominance or anger (Givens 1998). Thus, Jacques Bertin's observation (51) that there are no universal symbols is not entirely correct.

Another Paradox

Language is linear, yet it produces abstract and nonlinear ideas in us; ideas loosely associate with each other. Most iconography cannot produce abstract and nonlinear ideas in us, even with multiple dimensions. Abstract ideas are extra-dimensional, which means that they cannot be reasoned about the way a concrete object can be. So, we need simple and different iconography to express them. The finite surface we inscribe it on should be the context; what is up or down is good or bad. Consider: a sign can be transformed into another depending on point of view and context. Causes can become effects and vice versa; so things and ideas can follow from each other in nonlinear ways (Merrell 36).

Maps, Not Glyphs

Thus, the visual language would be in idea maps, not glyphs. Glyphs are linear pictograms; they would be hard to understand because their grammar would not be obvious; we assume English-like grammar, but there are other grammars. With many glyphs, or pictograms, the picture may represent either content or syllable, as in Egyptian hieroglyphics, which adds to the confusion (Robinson 84).

Maps are flat pictures of a place or phenomenon. A map would allow a grammar that would allow us to arrange things with economy, next to each other. Maps, like cave paintings, are often more iconic than arbitrary glyph systems in what they represent, like

a landscape, with only a few symbols that have to be defined in a legend (Sampson 34). Mapped means contextualized, with diagrams, overlays, numbers, words, and images (Tufte 2006, p. 13). Maps can show many different kinds of lines; it is clear what they mean from the context (Tufte 2006, p. 71).

Use of Visual Cues

Fortunately, there is a wide variety of visual cues we can use to discuss ideas visually: shape, color, direction, relative size, and space. Thus the language will try to imitate the most intuitive pictograms. What defines the sign itself is the substance (the characteristics of an individual shape). What defines the relationship of the sign to others is the form (the way each shape is different from the others) (Guiraud 29). The smallest noticeable difference would be the best for showing differences between entities (Tufte 1997, p. 73). That would mean using the shapes and their relations with one another to "show comparisons, contrasts, differences (Tufte 2006, p. 127)."

We will also have to "[s]how causality, mechanism, explanation, systematic structure (Tufte 2006, p. 128)." This means the cultural context of the assumption, how the assumption works in the text, and the structure of the assumption. This would fulfill Tufte's requirement to "show more than 1 or 2 variables" in analytical graphics (Tufte 2006, p. 129). This would be expressed as assumption, values behind the assumption, etc. The same "ink" would convey more information than one thing (Tufte 1990, p. 47).

Contrast

Contrast is the overarching principle that allows us to see difference in our world (Bang 80). Contrast between shapes could be used to represent the differences and nuances within an idea.

Repetition and Chaos

According to Molly Bang, author of *Picture This: How Pictures Work*, some repetition gives us security, but too much seems horrifying and inhuman; confusion is also frightening (78). The language might artfully use this complex interplay of repetition and chaos to express an idea's implications. For example, the idea of totalitarianism might use a row of identical figures to express the sameness of the society that totalitarian leaders wish to impose.

Shape and Color

There are some conventions with shape and color that come from how we respond emotionally to them. Pointed shapes are more threatening; rounded shapes are more secure and comforting (Bang 70-71). Since we see well during the day but not at night, light feels safe and like daytime, while dark feels more unsafe and like nighttime (Bang 68). Color is such an emotionally salient thing to us that we group objects of the same color together more strongly than we associate objects of the same shape (Bang 74-77).

There are, however, some practicalities with color that we must remember. More than 20-30 colors produces negative returns on color perception. We can easily distinguish only this much color without getting confused (Tufte 1990, p. 81). A few bright color spots over a pale background can "italicize data", with "an overall harmony" by highlighting particularly important parts of the data (Tufte 1990, p. 83). Otherwise, colors used should be colors found in nature, mostly of sky, shadow, and spots of bright color (Tufte 1990, p. 90).

Direction

Two-dimensional shapes, however, are not confined to shape and color. Flat and smooth horizontal shapes give a sense of stability and calm (Bang 42). Vertical shapes imply energy and aspiring to heights (Bang 44). Diagonal shapes imply motion

or tension (Bang 46). Where on the page the shapes are matters as well. If they are placed towards the upper half, they imply freedom, happiness, triumph, and spirituality (Bang 54). Towards the lower half, on the other hand, they imply conditions that are more threatened, heavier, sadder, constrained, and grounded (Bang 56). If they are higher on the page, there is more pictorial weight, more attention to the object, and more significance (Bang 56). The center is the greatest natural focal point; our eyes are pinned to a center with something in it, so a picture becomes more dynamic when the focal point is moved from the center (Bang 62-64). And the closer something is to the edge of the finite picture plane, the greater the tension (Bang 66). One possible implication for design is that we might use something that is close to the edge if we want to appeal to emotion more to make people understand concepts like Camus's rebellion (Camus 13).

Relative Size

The larger an object, the stronger it feels; the same figure feels more vulnerable small (Bang 72). This pattern is reflected in human body language. We can be symbolically smaller or larger depending on the status we wish to project. People who look larger are those to whose will we bend, while we dominate those who look smaller. The implication for design is that we ought to make more important principles larger than less important principles.

Space

Space on the finite picture plane is also an important consideration. A large amount of space isolates a figure and makes it more free and vulnerable (Bang 84). The seeming movement that is in a picture is determined by negative as well as positive space; this fits in with Edward Tufte's observation about space and "data ink" provided by both positive and negative space (Bang 85). Depth is implied by locating bases of

objects higher on page, and/or making them thinner and lighter (Bang 87). Proximity is the other obvious way than color to group objects that are otherwise identical (Hall 86). Time is also represented by space with convention; in the west, left to right (Hall 80, 88, 90).

Method

Since the problem I am trying to solve is one of agreement over abstract symbols, I conducted a paper test based on the computerized implicit association test. Implicit association tests were designed by Anthony Greenwald (1998) to measure phenomena in social psychology that are not easily measured by straight answers, such as prejudice. The test usually involves several pairs of words associated with single words that represent what is being studied. One example is names that subjects are to classify as "black" or “white”(Greenwald et al. 1998). This is supposed to measure prejudice, to find stereotypical thinking in people by giving users a task that seems benign. This is because prejudice and phenomena like it present themselves in concrete and insidious ways, like unconsciously wanting to hire a white person over a black person.

Contrary to some expectations that the test would be a fad, Greenwald in a 1998 article tested his own method, and found that it was better than self-reporting for predicting subsequent behavior to what was being measured, at least on socially fraught measures like prejudice. However, there is no way to measure to what extent the test picks up associations in the environment rather than implicit and unconscious biases (Azar 2008).

For my method, I chose to base my survey on the hypotheses about the association of concepts with shapes in Molly Bang's *Picture This*. I conducted an implicit association test based on the types of ideas I have discussed above. The test

presented pairs of shapes in opposite styles, one of which participants then picked as being "closer to" an associated word. For example, is the word “comfort” closer to a rounded shape or a pointy starburst (Bang)? Since the association test only involved binary choices, only binary choices, like the choice between pointy or rounded, will be discussed in this paper.

For data collection, a convenience sample of ten people was recruited through the listserv and by word of mouth. They each were given a paper survey asking them to pair a word with one of two shapes, indicating which shape is "closest" to the word, in order to provide some data that might guide future design of the language. No personal identifiers were needed for the subjects. The instructions were the following:
"I am developing a language of simple geometric icons for expressing philosophical ideas for use in making philosophy accessible to visual thinkers.
Circle the geometric shape from the two figures after each question that you feel expresses the idea best[.]"

Below I analyze the study data by charting the binary responses as a histogram, to show where the agreement about shapes is. The more people choose a certain shape as “closer to” the given word than the other shape, the more agreement there is about those shapes’ relations to that word.

Results

Analysis

In General, and Possible Problems

One problem with the survey was the lack of explicit instructions to explain in a sentence why they chose a particular shape, thus impeding clear analysis. Another was, due to the shortage of time, the small pool of respondents. Students at a southeastern American campus and some middle-aged teachers are unlikely to represent the world at large. If future researchers repeat my test, they may find different and interesting results. However, a few insights can be gleaned from the results.

Nature

The vast majority of respondents chose the more organic treelike shape to represent nature. This suggests that people associate nature more with the immediate trees than with the wholeness of the universe, represented by the circle. When describing ideas about things in nature, then, perhaps we ought to use more concrete

things. To most people in this study, the concrete represents nature better than the abstract.

Order

The same number of respondents chose the three parallel lines for order as chose the tree shape; the same person chose the circle and the random lines, unlike the others. Hence most participants preferred concrete references, but one either preferred abstractions or intentionally made unusual choices.

Significance

The vast majority of respondents felt that the large triangle represented significance better than the small one near the top, suggesting that size more than height represents meaning to the bigger picture. This could be taken as an indication that Egyptian artists were right: the most important figure in any figurative, rather than representational, depiction of a scene should be the largest.

Anti-(an idea)

Six out of ten respondents chose the inverted shape over the black one. One respondent even wrote that they liked the idea of the inverted triangle, but went no further. Participants seemed to perceive an inverted shape as an opposite more easily than the opposing color.

Divinity

The same number of respondents chose the large and small triangles. One respondent gives a possible clue about why this might be: they chose the small triangle at the top to represent the Holy Trinity of Catholicism. This probably means that one's religious beliefs affect one's conception of divinity in general.

Implications for Design

The language can be divided into "dialects" based on the viewers' culture. The language would also have to be designed in such a way that different cultures could learn each others' "dialects", thus facilitating cultural exchange of ideas. This means sticking to the simple shapes offered in the test sample of ideas, as well as silhouettes of people with certain universal body language. This universal body language will make it easier for people across cultures to learn the language's different "dialects".

To make the learning easier, the language's design ought to stick with only a few basic ideas, as in the ones I outlined in the introduction. Fortunately, we can create a lot of complexity with only a few different ideas, as only twenty-six letters can create a vast variety of words.

Most of the complexity would be in the language's emergent properties. In biology, emergent properties are those that emerge as things come together from molecules, to cells, to organisms. The brain is an excellent example of this complexity. On their own, neurons cannot think, but with billions of them, thoughts and consciousness can emerge from their connections to one another.

Similarly, grammar in a language gives ideas their complexity by connections between words. Even a sentence with identical words can mean different things; for example, "man bites dog" means something different from "dog bites man." Grammar, however, is more than ethereal relationships of words and sounds. It is an entire system that specifies these relationships (Chomsky 91). In our language, this means that the designer ought to create strict rules for visual representation that aid audience understanding. The study I have done paired shapes with words, and thus is only a first step in the design of a language that would not require many words to understand it.

Since the designs will sprawl over two dimensions rather than having a linear structure like most languages, the "grammar" of the language should be based on

directions in which the images are read. For example, a shape representing a more key idea could be at the top or closer to the center. The rules for representation must also be such that the representation of the ideas is adjustable to reflect the audience "reading" and "writing" in this universal language. For example, native Arabic speakers, accustomed to reading right to left rather than left to right, would need flipped directional rules. This is just one of the differences between the projected dialects of the visual language.

To further simplify the language, the designer should stick to a binary structure of ideas, as in good/evil, raw/cooked (as Claude Levi-Strauss would write). This may show more easily the ways in which ideas are related to one another. In doing this, though, we would have to avoid oversimplifying ideas. The map format, rather than the glyph format, may help here. The mapped web of ideas would create context for those concepts represented, and dissect the assumptions behind those ideas. For example, in representing the idea of love, we might connect a representation of people hugging with lines representing opposites, to pictures representing hate and indifference. Also connected to the picture representing love will be a picture representing friendship, a picture representing romantic intimacy, and one representing empathy. These pictures would show, then, different aspects of love, and help people unpack their assumptions about what love means by breaking the concept into its constituent parts.

Conclusion

This language will be an attempt to help people unpack, rather than simply restate, what their assumptions are about a particular concept. Mapping out the structure of assumptions can make them transparent to us as visual creatures, even if we are not trained in formal logic.

We have seen that the complexity of ideas requires organization in our minds. However, in attempting to organize these ideas, we may oversimplify them. Seeing a visual representation of these ideas in all of their complexity is, I hope, a way to situate them in our minds without oversimplifying them by taking some of the burden of unspoken assumption from the human brain.

Future work on this problem could include testing different cultures and their symbolic preferences, testing augmented reality idea mapping in the context of real world objects, and visual library cataloging systems. The second and third of these require the most explanation. Augmented reality is a system whereby the virtual is integrated with the real to perceive what hidden or make believe qualities are in real world objects. Idea mapping could be integrated into historical artifact viewing to explain the abstract context of these real objects. A Gutenberg Bible could be viewed in a virtual reality idea landscape that explores Reformation religion and the printing press. Visual library cataloging could allow patrons to arrange ideas presented in a visual network and be encouraged to find resources slightly out of their ken, encouraging serendipity and curiosity.

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